

8.0 SIGNIFICANT ENVIRONMENTAL IMPACTS

8.1 INTRODUCTION

This chapter analyzes the significant environmental impacts of the entire Forest Resource Plan. It does not identify significant environmental impacts of specific preferred policies. Because the plan is a policy and planning document, the analysis also does not contain a discussion of site-specific impacts. The department will review site-specific environmental impacts when it is ready to undertake activities (such as individual timber sales) at a particular location. This ongoing (phased) review allows the department to examine the impacts of specific activities at a later time, evaluate whether the action should proceed and decide whether mitigation measures, if any, are appropriate.

The environmental impacts below are arranged in the form of the checklist in **Table 24** at pages 123 and 124. This format allows for easy cross-referencing between existing environmental conditions and the significant environmental impacts of the plan. A discussion of mitigation measures and unavoidable adverse consequences follows after each major subject headings (for example, earth, air, water, etc.).

The department recognizes that each of its activities may affect different components of the forest environment. Timber harvesting, for instance, can affect soils, wildlife habitat and water quality. Where appropriate, the text below includes cross-references to other sections in this chapter or to other parts of the plan, allowing the reader to obtain a more comprehensive and integrated view of the potential impacts of department activities on state forest land.

8.2 FOREST PRACTICES ACT

The state Forest Practices Act and its rules and regulations govern how timber is harvested from state and private lands in Washington. The specific regulations are written by the Forest Practices Board. The rules and regulations offer mitigation and protection for key nontimber resources, such as fish, wildlife, soils and water quality. Individual regulations are not discussed in detail in this chapter but they are mentioned in the text when the regulations have the potential to mitigate a significant adverse environmental impact (such as erosion caused by road building or logging on unstable slopes).

Where specific policies in the Forest Resource Plan also offer some mitigation (for example, where the department will consider the effects of nontimber resources, such as wildlife, fish and water quality, on its activities), these policies are cited in the text below.

8.3 PHYSICAL EFFECTS

Most of the physical impacts occur because of timber harvesting and related activities, such as the construction of logging roads.

8.3.1 Earth

8.3.1.1 Geology and Topography

The Forest Resource Plan will have a minimal impact on geology and topography, except where road building is required to provide access to sites where timber will be harvested. Typically, these roads will only affect the area's geology in superficial ways, though topographic contours can be modified if substantial amount of earth material is moved. Proper planning and adherence to Forest Practices Act rules and regulations will keep impacts to a minimum. (Rock quarrying can also affect geology and topography by removing soil and rock and by covering over the excavated site. Quarrying operations, other than those necessary for logging, road construction and management, are the responsibility of the department's Lands and Minerals Division and are not addressed by the plan.)

8.3.1.2 Soils and Erosion

Road construction, method of timber harvest and type of equipment can affect soil stability and accelerate erosion, as described in more detail below.

1. Road Construction

Nearly all studies of erosion associated with timber harvesting conclude that most erosion is caused by road construction (for example, inadequate road drainage). Road construction also destroys and displaces vegetation. Unlike areas that have been harvested, the surfaces of road cuts and fills seldom retain pre-existing soil character. To avoid these consequences, the department attempts to ensure that its road system creates as little impact as possible. Specific mitigation measures are discussed in section 8.3.1.4 below.

2. Method of Timber Harvest

The method of harvesting timber can also cause erosion. The degree of disturbance and consequent erosion differs widely with soil characteristics, intensity of the timber cut, care used in logging and type of equipment used. Clearcut timber harvesting, for example, may reduce root strength and change the hydraulic regime of the area.

Studies in Oregon, British Columbia and southeast Alaska show that debris avalanches increased substantially in forested areas that had been clearcut. Mass movement of soils and debris has been associated with timber harvest throughout Washington, particularly in western portions of the state.

Shelterwood cutting requires multiple entries, usually by ground skidding equipment to complete the harvest, and may significantly disturb the soil. In contrast, timber remaining in a partial cut can protect the soil surface by providing a network of living roots that holds the soil in place.

3. Type of Equipment Used

In harvesting timber, the department can choose between removing the timber on the ground (which typically involves roads, tractor skidders, etc.) or removing the cut timber in the air. Yarding techniques that completely suspend the log above the soil result in a minimum of soil disturbance. These techniques include the use of helicopter and certain types of cable systems. They reduce the amount of roads needed to harvest timber and therefore have fewer impacts on soils than tractor skidders.

Because tractor skidders drag logs across the site, they tend to cause soil compaction. The extent of compaction depends on the type of soil at the site. Fine-textured soils, for example, are more susceptible to compaction. Once compacted, they become more impervious to water. After heavy rains, the water either collects on top or runs off, depending on the slope. Compaction also increases soil density, reduces aeration and tends to reduce forest productivity by limiting the growth of seedlings.

The lowest cost logging method tends to have the greatest adverse potential on soils. Lower cost methods consist of ground yarding systems which are likely to cause more soil compaction and disturbance.

8.3.1.3 Unique Physical Features

The department has a special lands policy that calls for the protection of unique ecological features. The department has a mechanism to protect at least some of these special features and prevent timber harvesting from affecting these sites. If the unique feature is an exceptional wetland or a special old growth stand, it could be severely impacted or destroyed by logging. The department recognizes the value of special physical and plant features and attempts to preserve them as conservation or preserves areas (see Policy No. 13, Special Ecological Features), if funding is available.

Removal of trees during timber harvest has varied impacts on unique physical features. In some instances, small-scale features become more visible, at least until new trees develop at the site. Other activities, including site preparation, planting and fertilization, tend to speed reforestation and shorten the exposure of unique physical features.

8.3.1.4 Mitigation Measures (Earth)

The department will consider the effects of timber harvesting on geology, topography, soils and erosion. Forest Practices Act regulations contain several measures to mitigate the adverse impacts of harvest activities. They require, for example, that logging systems must be matched for the terrain and soil at the particular site. The regulations prefer uphill yarding and require that tractor and wheeled skidders not be used on exposed, erodible soils when soil moisture content is so high that unreasonable rutting or stream, lake or pond siltation would result. Shovel logging systems that use wide track "loaders" to move logs by lifting and stacking reduce the effects of compaction. These newer systems allow logging on soils that are sensitive to compaction and disturbances; in most instances, they are economically competitive with tractor skidders.

As with other forest management activities, knowledge of soils can help eliminate the potential negative impacts of timber harvesting. Certain soils, for instance, are more subject to compaction when timber is harvested during the rainy season than at drier times. These soils should be logged only during the summer dry season. Other soils, particularly those with coarse textures and adequate drainage, can be logged throughout the year with little negative impact. Soil survey information can identify areas where soil stability and erosion hazards may require the use of systems that suspend logs during yarding from stump to landing, thus keeping soil impacts down to an acceptable level. An on-site evaluation is usually needed to supplement the soil survey data.

The department performs reforestation and encourages growth of selected vegetation that reduces erosion. (See Policy No. 31, Harvest and Reforestation Methods). The department's preferred policy on reforestation requires it to select the most appropriate reforestation method after considering both economic and environmental factors.

When it comes to mitigating the effect of roads, the department plans to maintain a road system that limits effects on the forest environment. (See Policy No. 28). The department intends to reduce the total amount of roads by coordinating and cooperating with others.

In some cases, the department intends for some roads to be temporary. After use, the department will block off these roads, remove culverts, install water bars to reduce erosion and abandon the road.

Other policies in the plan will also help mitigate the effects of timber harvesting on geology, topography and soils. The creation of riparian management zones may reduce the impact of logging by providing buffer areas for streams and aquatic systems that are wider than mandated by the Forest Practices Act and regulations. Establishing these riparian management zones reduces or eliminates the danger that suspended soil particles will directly enter streams. (See Policy No. 20 on riparian areas. The preferred policy on wetlands, Policy No. 21, will also help protect these areas against similar degradation from timber harvesting and other activities.)

In addition, the department may use selective cutting when appropriate to reduce the visual impact of logging on unique physical features. (See Policy No. 31.)

In sum, the Forest Resource Plan requires the department to consider soils, water quality and other nontimber resources when choosing the method of harvest and reforestation. Using a variety of methods and equipment to match site conditions, as the department proposes to do, will minimize erosion and changes in topography.

8.3.1.5 Unavoidable Adverse Impacts (Earth)

Erosion occurs on a limited scale in an undisturbed forest environment. Forest management activities, particularly certain types of timber harvesting, expose and compact the soil, thus creating conditions under which erosion is more likely. Construction and maintenance of roads, utility lines, trails, and recreation sites can all impact soils and topography.

Many of these adverse impacts cannot be eliminated if extensive harvesting continues, but they can be mitigated as described above, and the adverse impacts will be substantially reduced.

The department will minimize these impacts by thoroughly evaluating the soils on state forest land and by carefully using geological, topographic and climate data.

8.3.2 Air

8.3.2.1 Air Quality

Forested lands enhance Washington's air quality in several ways. The major positive impact of a forest on air quality occurs through the process of respiration, by which plants consume carbon dioxide and produce oxygen.

Because animals do just the opposite, the plant and animal communities both benefit by this symbiotic relationship.

Conifer trees photosynthesize at higher rates than deciduous trees, providing more oxygen. Trees also inhibit the spread of wind-carried particulates by either trapping the material on the leaf or needle surface or slowing wind speed to a point that the particulates cannot remain suspended. They also act as a windbreak, stabilizing soils on the sheltered side for a distance up to twice the tree's height. Forests hinder development of ground fog by releasing accumulated heat more gradually than open areas.

Harvesting timber temporarily removes the beneficial effect that trees have on air quality. In addition, harvesting activities may have some minor but detrimental impact on air quality. Logging trucks on unpaved roads create dust, and heavy equipment produces hydrocarbon emissions. These adverse impacts, however, are short-term, localized and relatively small.

8.3.2.2 Climate

Most of the department's land management activities have little or no effect on local or regional climate conditions. Average daily temperatures will remain about the same. Any impact will only be felt on individual sites that have been harvested (microclimate effects).

Timber harvesting by clearcutting has a more marked effect on local climate than other methods. Maximum temperatures are generally higher, and minimum temperatures lower on clearcut sites. Average diurnal temperatures, however, are about the same.

In clearcut areas, the snowpack melts earlier and evaporation is greater. Wind movement increases near ground level because the friction surface after clearcutting shifts from tree top to ground level. These impacts, however, are only temporary; they last until the site is reforested and trees dominate the area again.

8.3.2.3 Odor

Dust and odors from logging truck traffic on unpaved roads can be considered annoying in local areas but this impact is short-term.

Odors from herbicide applications are caused primarily by petroleum-based carriers which are used with herbicides. (Herbicides are used primarily for vegetation control. For general information on herbicide use, see Policy No. 33, Control of Competing Vegetation.)

The small amount of carrier used per acre is seldom discernible. Diesel and similar light petroleum products are used in dormant (winter) spraying; as a result, the active herbicide sticks to bare deciduous branches. Diesel carrier can be offensive in certain cases until vaporization is complete. Odor is most noticeable immediately after spraying. Spraying during calm or light wind periods limits the range of odor to the immediate spray area. The odor is generally only slightly offensive and is concentrated in a small area.

Odors caused by drying or decomposing leaves, needles and branches left in the woods after a timber harvest are generally considered pleasant. These same odors occur naturally in the forest during the autumn, when leaves from deciduous trees and shrubs drop and decompose or when trees die from insect, disease or other natural causes. Whether harvesting occurs or not, the same odors are present in varying degrees in the forest.

With the exception of these relatively minor impacts, the plan will not create additional odor effects or impacts.

8.3.2.4 Mitigation Measures (Air)

The department will use the most effective techniques available to protect air quality, minimize climate variations and reduce odors.

1. Reducing Slash Burning

The department deemphasizes slash burning as a site preparation method. It expects to burn only about 500 acres per year, only about six percent of what was estimated in 1983 in the Forest Land Management Program, when the department predicted it would burn about 9,000 acres per year. (If the department continues to harvest timber from about 30,000 acres per year, as it did in the 1980s, the acreage burned would only be about 1.6 percent of the total harvested.)

More than 90 percent of all burning on state forest land will be completed before the stable air periods of September and October; it will be done under the auspices of the Washington State Smoke Management Program of the Washington Clean Air Act. The Smoke Management Program dictates that smoke from debris burns be vented high into the atmosphere, away from major population centers.

2. Minimizing Microclimate Effects

Slash burning can increase seasonal and daily temperature extremes; it increases wind speed at ground level by removing vegetation and small debris and it affects moisture availability by creating greater fluctuations between drought and wet periods. This impact, however, is temporary and lasts one to two years at the most. Effects on microclimate can be mitigated by leaving herbaceous and organic layers intact. Using mechanical site preparation or thinning, rather than slash burning, will also reduce impacts on microclimate. Immediate reforestation will reduce extremes of temperature and moisture at soil and low vegetative layers, and wind speeds there.

3. Reducing Road Dust

When dust from vehicles on forest roads poses a visibility or safety problem or when it adversely affects an adjacent landowner, the department considers the following mitigation measures: 1) lowering speed limits on construction equipment; 2) periodic watering of the road; 3) applying other dust control substances; and 4) increased oiling and paving (an expensive option which is not warranted on roads with low traffic).

8.3.2.5 Unavoidable Adverse Impacts (Air)

There are two unavoidable adverse impacts on air from sustained logging on state forest lands. First, slash burning can create some pollutants, though these are relatively minor. The department has reduced substantially the acreage it burns, but some slash burning (approximately 500 acres per year, as discussed above), is likely to continue.

Second, vehicular traffic on unpaved roads can create dust in certain seasons, an effect that cannot be eliminated during dry periods. The department does not believe that traffic volume and expense warrants paving many roads. Vehicular emissions, however, are not a significant source of pollution because the amount of traffic and the pollutant concentrations are relatively low.

Some air quality degradation from vehicles will also occur from harvest operations, road construction, recreation sites and off-the-road vehicle trails, etc. Camp fires and vehicle emissions will be the main adverse impacts from recreational uses. These impacts are relatively minor.

Air quality can also be greatly affected by emissions from wildfires. Particulate emissions from wildfires average about 150 pounds per ton of fuel burned -- or three to four times as much as the emissions from prescribed fires. In addition, the amount of fuel burned per acre is generally greater.

A final impact, from the occasional aerial spraying for insects or disease, may also create short-term air quality degradation. These activities will be analyzed at the site-specific level if and when the department decides to proceed with this option. The department did not use aerial insecticides in the 1980s and does not anticipate using these products in the 1990s, though it believes this option must be kept available to prevent significant losses to trust assets.

8.3.3 Water

8.3.3.1 Surface Water

The department's activities can affect the quantity and quality of surface water, as summarized below.

1. Accumulation of Debris

Timber harvesting can affect the quality and quantity of surface water depending on how much debris is left near stream channels. Slash or debris left in or near streams after logging can cause a river to back up. If accumulations or jams backing up water suddenly give way, a surge of water will rush down the channel. The Forest Practices Act rules and regulations normally require slash and debris to be removed from stream channels except in Type 5 water (streams that dry up for a portion of the year).